

의편협 아카데미
2013.12.5 (목)
15:20-16:00

서론, 재료 및 방법, 고찰 다듬기

연세의대
김명진

서론

서론에서 흔히 보이는 오류

- 서론의 기본 구성요소가 빠졌다.
- 각 요소의 내용이 모호하다.
- 배경설명이 너무 제한적.
- 불필요한 문헌고찰.
- 길이가 너무 길다.

AH Hofmann. Scientific Writing and Communication

Interest your audience and provide context

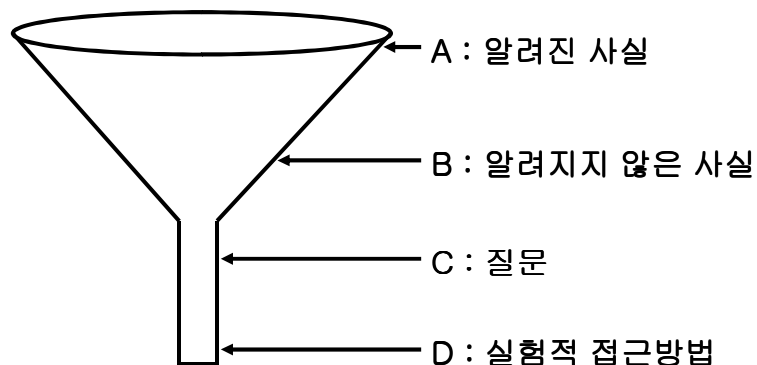


- 새롭고 (new/novel) 중요한 (important, interesting) 주제(topic)인가?

- 서론의 기본 요소가 다 기술되어 있나?

서론의 구조 : 가설검증논문

“깔때기 구조” (Funnel Structure)



Optional:
Results/Conclusion/Significance

*Zeiger, Mimi 1999. Essentials of Writing
Biomedical Research Papers*

예문 4.1 짧은 서론

^A It is known that several general anesthetics, including barbiturates, depress the bronchomotor response to vagus nerve stimulation (1-3). ^B However, the site of this *depression* has not been *determined*. ^C To *determine* which site in the vagal motor pathway to the bronchioles is most sensitive to *depression* by barbiturates, ^D we did experiments in isolated rings of ferret trachea in which we stimulated this pathway at four different sites before and after exposure to barbiturates.

- A 알려진 사실 (일반적인 주제)
- B 알려지지 않은 사실 (구체적인 주제)
- C 질문
- D 실험적 접근방법

Components of Introduction

Investigative paper	Descriptive paper
Background (Known)	Background (Known)
Unknown	(reason/problem)
Question/Purpose	Discovery statement
Experimental approach	(experimental approach)
(results/conclusion)	Description
(significance)	Implication

Background

- 배경설명이 너무 제한적인가?
 - 혹은 너무 장황한가?

Background 1

- **FR2** is a member of the DExD/H-box family of proteins (1). DExD/H-box family proteins possess NTPase and often helicase activity (1). FR2 exhibits NTPase and helicase activity from its C-terminal helicase domain (FR2hel) (2,3). FR2 also binds to HCV NS4A to form the complex FR23-4A. FR2-4A exhibits serine protease activity from its N-terminal protease domain (4,5) and is localized to the surface of the endoplasmic reticulum via NS4A (6).

Background 2

- Hepatitis C, which is caused by the Hepatitis C virus (HCV), infects an estimated 170 million people worldwide and 4 million in the United States. An essential replicative component of HCV is FR2 (1,2). FR2 is a member of the DExD/H-box family of proteins (3). Like other members of this family, FR2 exhibits NTPase (3). In addition, FR2 also displays heticase activity from its C-terminal helicase domain (FR2hel) (4,5), an activity that is often seen in other DExD/H-box family members (3). Furthermore, FR2 binds to HCV NS4A to form the complex FR2-4A, which exhibits serine protease activity from its N-terminal protease domain (6,7) and which is localized to the surface of the endoplasmic reticulum via NS4A (8).

Describe Unknown/Problem: Don't Do & Do

Don't Do	Do
... does not seem to understand ...	The results of study X have been questioned.
... failed to	One study found A, another study found B.
... made the mistake of...	Findings on X are controversial.
... used improper methods ...	Although A showed X, our results do not agree ...

- 연구 목적이 명확하게 제시되었나?
 - (현재형인가?)
 - ◆ *To determine which site in the vagal motor pathway to the bronchioles is most sensitive to depression by barbiturates,*
...
 - ◆ *(x) To report (describe) the vagal motor pathway to the bronchioles sensitive to depression by barbiturates ...*

- 각 요소들은 논리적으로 연결되는가?
 - Background (Known)은 unknown과 연관되는가?
 - Unknown을 읽으면 study question이 연상되는가?
 - 실험적 접근 방법이나 대답은 study question에 연결되는가?

예문 4.1 짧은 서론

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- 서론의 각 요소를 시작하는 신호가 적당한가?

Signals of Introduction

Background	Unknown	Question, Purpose, Discovery	Experimental Approach	Results	Implication
X is...	... is unknown	We hypothesized that ...	To test this hypothesis, we...	We found...	...consistent with
X affects...	.. has not been determined	To determine...		...was found	...indicating that
X is component of Y	The question remains whether ...	To study..., To examine..., To assess..., To analyze...,	We...	We determined...	...make it possible to
X is observed when Y happens	... is unclear	In this study we examined... Here we describe... Here we report...	We analyzed... For this purpose, we... ... by/using...	Our findings were...	...may be used to... ...is important for...
X is considered to be does not exist	This report describes...	For this study we...	We observed that...	Our analysis implies/suggests...
X causes Y	... is not known	We examined whether X is... We assessed if... We determined if... We analyzed Y...	To answer this question we...	Based on our observation...	Our findings indicate that...

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- 길이가 적당한가?
 - < 2 double-spaced pages
 - 불필요한 문헌고찰?
 - 적절한 참고문헌을 적절한 자리에 인용?

문단의 구조적 측면

- 문단
 - 주제문, 뒷받침 문장, (결론)
 - 통일성과 연속성

문단의 통일성과 연속성

주제문

GOLD

통제어(controlling idea)

Gold, a precious metal, is prized for two important characteristics. First of all, **gold** has a lustrous beauty that is resistant to corrosion. Therefore, **it** is suitable for jewelry, coins, and ornamental purposes. **Gold** never needs to be polished and will remain beautiful forever. For example, a Macedonian coins remains as untarnished to day as the day it was minted twenty-three centuries ago. Another important characteristic of gold is usefulness to industry and science. For many years, **it** has been used in hundreds of industrial applications. The most recent use of **gold** is in astronaut's suits. Astronauts wear **gold-plated** heat shields for protection outside spaceships. In conclusion, **gold** is treasured not only for its beauty but also for its utility.

연속성을 위한 기법

- 각 단계를 새로운 단락으로 시작하라.
- 연결구를 이용하여 연결시켜라.
- 핵심용어를 반복 사용하라.
- 앞선 단계를 그 다음 단계를 기술하는 문장의 주어로 사용하라.

Example: Long Introduction 단락 1

알려진 사실

(일반적인 주제) ^AHeart development in animals as different as (핵심용어 반복) insects and vertebrates involves related *NK-2 family homeobox genes* (1). ^BIn *Drosophila*, (a kind of insects), the *tinman* homeobox gene is expressed in cardiac precursors, and *tinman* mutants completely lack a heart (2-4). ^CLikewise in vertebrates, the *nkx2.5* homeobox gene is expressed in myocardial precursors (5-9), and mouse *Nkx2-5* mutants exhibit defects in cardiac morphogenesis and gene expression (10). (중요성) ^DThis **remarkable** molecular conservation suggests that a common mechanism controls heart development in a wide variety of species.

Proc Natl Acad Sci U S A. 1998; 95: 5072

Example: Long Introduction 단락 2

또 다른 알려진 사실

nematodes have no heart or defined circulatory system. ^FHowever, evidence suggests that the **nematode pharynx**, a rhythmically contracting organ involved in feeding, shares functional and molecular similarities with the heart in other species. ^GAt the functional level, pharyngeal muscle contraction, like the contraction of vertebrate cardiac muscle, does not require nervous system input (11). ^HAt the molecular level, pharyngeal muscle development involves not the MyoD family of myogenic regulatory factors (12, 13) but the homeobox gene *ceh-22*, which is related to *tinman* and *nkx2.5*. ^I*ceh-22* is expressed exclusively in pharyngeal muscle, where it binds the enhancer of the pharyngeal muscle-specific *myo-2* gene, and a *ceh-22* mutant displays defects in pharyngeal morphology and function (13, 14).

Example: Long Introduction 단락 3

알려지지 않은 사실, 중요성, 질문, 실험적 접근방법

^JThese functional and molecular similarities (→2번째 단계를 문장의 주어로 삼아 연속성 유지) suggest that these genes perform similar functions. (알려지지 않은 사실, 중요성) ^KThis suggestion in turn implies that the mechanism that controls heart development in insects and vertebrates may also control pharyngeal development in nematodes. (질문) ^LWe therefore hypothesized that the nematode gene *ceh-22* and the vertebrate gene *nkx2.5* perform similar functions. (실험적 접근 방법) ^MTo test this hypothesis, we examined the ability of the zebrafish *nkx2.5* gene (8, 9) to substitute for the nematode *ceh-22* gene in transgenic *Caenorhabditis elegans*.

서론 작성 지침

1. 갈때기 구조를 사용한다.
2. 충분한 배경 설명을 하되 과도한 문헌 고찰을 하지 않는다.
3. 알려지지 않은 사실을 분명하게 적는다.
4. 연구 목적을 분명히 한다.
5. 실험적 접근 방법을 간략히 소개한다.
6. 문단의 일관성과 연속성에 유의한다.
7. 새롭고 중요한 점을 분명하게 하여 독자의 관심을 끈다.
8. 되도록 간략하게 쓴다.



재료 (대상) 및 방법

재료 및 방법에서 흔히 보이는 오류

- 필요한 내용이 빠짐.
- 특정 실험을 왜 했는지 알 수 없는 경우.
- 특별한 이유 없이 수동태에서 능동태로.
- 특별한 이유 없이 과거시제에서 현재시제로.

- 재료나 대상의 특성을 적절하게 기술하였나?

Materials

- **약품:** 일반명, 생산자, 순도, 농도, 용매의 종류, pH, 온도, 주입된 총량, 주입 속도, 주입 기간
- **배양액과 완충액:** 구성요소, 농도, 온도, 부피, pH
- **기체:** 구성요소와 각각의 농도, 유속
- **실험 대상:** 분자, 세포주, 조직
- **동물:** 종, 체중, 변종, 성별, 나이, 진정과 마취, 소속 기관의 해당 위원회 승인
- **사람:** 나이, 성별, 인종, 키, 체중, 건강 또는 질병 상태, 구체적인 치료, 선정 기준, 배제 기준, 소속 기관의 해당 위원회 승인

- 윤리지침에 따라 연구가 수행되었나?
 - Informed consent 및 IRB 승인 등과 같은 실험윤리 준수에 관한 사항이 적절히 기술되었나?
 - “Our Investigational Review Board approved this study.”

- 결과를 얻는데 필요한 모든 절차를 기술하였나?

방법(Methods)

- 무엇을?
- 어떻게?
- 왜 ?

Methods: 무엇을 했는가?

- 연구디자인: 실험의 전체 조망 제시 (주제문)
 - 질문, 개입 (독립변수), 측정값 (종속변수)
 - 대조군(controls)
 - 각 실험의 구성, 순서(개입, 측정, 실험), 기간, 샘플 규모

방법 설명과 참고문헌

- 숙련된 연구자라면 결과를 재현할 수 있을 만큼 충분한 내용과 참고문헌이 제시되었나?
 - 불필요한 세부 사항을 포함하지는 않았나?
 - 참고가 될만한 세부사항은 부록을 활용.

실험 방법: 어떻게?

- 잘 알려진 방법
- 잘 알려지지 않은 방법
- 개량한 방법 또는 새로운 방법

실험 방법 설명: 잘 알려진 방법

- 설명 없이 참고 문헌 제시
 - *In these samples, lipids were extracted (Bligh and Dyer, 1959) for phosphorus determination (Bartlett, 1959) and for thin-layer chromatography (Poorthuis et al., 1976).*

실험 방법 설명: 잘 알려지지 않은 방법

- 핵심적인 특징 기술, 참고문헌 제시.
 - *Lamellar bodies were isolated according to a previously reported procedure (Baritussio et al., 1981). This procedure separates lamellar bodies into two populations that have different densities: light lamellar bodies, which are collected between 0.33 and 0.45 M sucrose, and dense lamellar bodies, which are collected between 0.45 and 0.58 M sucrose.*

실험 방법 설명: 개량한 방법 또는 새로운 방법

- 개량한 방법:
 - 개량한 것의 근본적인 특성과 목적 기술.
 - *In lamellar bodies and other fractions obtained from the density gradient procedure, the amount of protein was determined (Lowry et al., 1951) using 1% sodium dodecyl sulfate (Eastman Kodak, Rochester NY) to reduce interference by lipids (Lees and Paxman, 1972).*
- 새로운 방법
 - 완벽하게 설명 → 독자들이 평가하고 재현.

- 결과에 기술될 내용을 포함하지는 않았나?
 - 단, 다음 절차를 설명하기 위해 필요한 중간결과는 포함할 수 있다.
- 결과를 얻는데 필요한 방법 설명이 빠졌나?

- 적절한 주제 또는 소주제 별로 정리되어 있나?

전반적 조직

- 주제별로 구분하고 소제목을 붙임.

Animal Studies	Clinical Studies
Materials	Study subjects
Animals	Inclusion criteria
Preparation	Exclusion criteria
Study design	Study design
Interventions	Interventions
Methods of measurement	Methods of measurement
Calculations	Calculations
Analysis of data	Analysis of data

서브섹션내의 구성

- 시간순 또는 중요도순
 - 실험과정; 시간 순
 - 변수: 독립변수 먼저 (시간 순), 종속변수
중에서는 목적에 답하는 변수 먼저 (중요도순)

- 새로운 주제는 적절한 신호를 사용하여
연결하였는가?

새로운 주제를 알리는 방법

- 소제목: 서브섹션의 주제
 - **Gel Filtration.** *After centrifugation at 100,000 x g for 20 min, soluble beef liver extracts were subjected to gel filtration on a Superose 12 column ...*
- 주제문: 단락의 주제
 - *The effects of intra-arterial pressure gradients on steady-state circumflex pressure-flow relations derived during long diastoles were examined in five dogs. To obtain ...*
- 연결구 및 연결절
 - *To prepare the enzyme solution, the cells were first incubated...*

각 부분간의 연결성을 유지할 것

- 실험절차가 연구목적과 연관되어 있음을 확인할 수 있도록 연구디자인을 설명하면서 질문을 반복.
 - ◆ (주제문 사용) *The effect of high-frequency ventilation on the discharge of the three known types of pulmonary receptors was ascertained as follows. After a single afferent nerve fiber from a slowly adapting pulmonary stretch receptor, ...*
 - ◆ (연결절 사용) *To determine the effect of beta-adrenergic agonists on clearance of liquid and protein from the lungs, we instilled ...*
- 본래 질문과 동일한 핵심용어, 동사, 관점을 사용할 것.
- 방법을 결과와 연관시킬 것
 - 결과 섹션의 각 결과에 해당하는 방법이 방법 섹션에 있어야 한다.

- 기능이 명확하지 않은 실험절차가 기술되었나?

왜 실험을 수행했는가

- 서론에서 제기한 질문과의 연관성이 분명하지 않은 경우
 - To + 동사, For ...
 - ◆ *The material was eluted in ..., **to separate** collagenase-resistant fragments...*
 - ◆ **For primary culture**, the cells were resuspended in ...
 - Because (생략 가능 → semicolon [;] 사용)
 - ◆ *Bovine serum albumin was included in the binding medium **because** albumin reduced ...*
 - ◆ *Radiolabeled surfactant protein A was used ...; storage for longer periods of time reduced binding of protein to cells.*

- 시제와 동태(능동/피동)가 적절한가?
 - 뚜렷한 이유 없이 관점을 바꾸지 않는다.

관점 (Point of view)

- 수동태가 많이 쓰임. 왜?
 - Materials & methods 강조.
 - 누가 했는지가 중요하지 않음.
 - *The principal investigator collected the different fungal species from various tepuis in Venezuela. → Different fungal species were collected from various tepuis in Venezuela.*
- 이유 없이 관점을 바꾸지 마라.
 - *The assays were performed for 10 min at room temperature. We then added 10 ml of 95% ethanol. → The assays **were performed** for 10 min at room temperature. The 10 ml of 95% ethanol **were added**.*

시제

- 동사의 시제: 일반적으로 과거
 - ◆ *we measured, catheters were inserted*
- 제시된 데이터를 설명할 경우, 현재
 - ◆ *Data are summarized as mean \pm SD*

- 정확한 단어를 사용하였는가?

정확한 어휘 선택

- 동물: 단순히 'animal'이라고 쓰지 말고, 동물의 이름을 사용할 것 (개, 고양이 등)
- Measure, calculate, estimate의 용어 구분
 - ◆ "We measured heart rate and ventricular pressure and calculated maximal positive dP/dt ."
- Determine; measurement and calculation
 - ◆ "We determined heart rate, ventricular pressure, and maximal positive dP/dt ."
- Study, experiment, series, group의 용어 구분
 - ◆ Study: 현상이나 발달, 질문에 대한 지속적이고 체계적인 조사.
 - ◆ Experiment: 가설의 타당성을 조사하기 위한 시험 (대상이 인간일 경우 study라고 함)
 - ◆ Series: 서로 연관된 2개 이상의 실험
 - ◆ Group: 같은 특성을 갖는 실험동물 또는 인간

재료 및 방법 지침

1. 훈련된 연구자라면 연구를 재현하기에 충분한 내용과 참고문헌을 기술하되, 불필요한 세부 사항을 포함하지 않는다.
2. 재료 및 방법 이외에 결과를 포함하지 않는다.
3. 긴 설명이 필요한 세부사항은 부록을 활용한다.
4. 적절한 주제 또는 소주제 별로 내용을 정렬한다.
5. 새로운 주제는 적절한 신호를 사용하여 연결한다.
6. 기능이 명확하지 않은 실험절차는 그 목적을 설명한다.
7. 수동태가 종종 바람직하다.
8. 뚜렷한 이유 없이 관점을 바꾸지 않는다.
9. 정확한 단어를 사용한다.
10. 윤리 지침을 따르고 기술한다.

고찰

고찰의 3단 구성

- 질문에 대답하라.
- 뒷받침하는 근거를 제시하라.

- 기존연구와 비교하고 이번 연구의 참신성을 제시.
- 연구의 제한점을 기술.
- 예기치 않은 발견을 설명.
- 가설 또는 모델 제시

- 요약하고 주장하라.
- 중요성 및 시사하는 바, 향후 방향은 무엇인가?

고찰의 시작

- 주요결과를 제시하고 해석하여 최초의 연구 질문(목적)에 답하고 있는가?

질문에 대한 대답

- 질문한 그대로 각 질문에 대답하라.
 - 질문과 동일한 핵심용어, 동사, 관점, 방식으로 대답.
 - ◆ *질문*: “Dose sympathetic stimulation increase norepinephrine synthesis in an superior cervical ganglia in vivo?”
 - ◆ *대답*: “This study shows that sympathetic stimulation increases(dose not increase) norepinephrine synthesis in an superior cervical ganglia in vivo”
- 현재시제를 사용.
 - 대답이 실험군이 포함된 전체 모집단에도 참이어야

하지 말아야 할 것

- 제2의 서론으로 고찰을 시작하지 말라.
- 결과의 요약으로 시작하지 말라.
- 부가적인 정보로 시작하지 말라.

대답과 관련된 신호

- 대답을 기술하기 전에 신호를 보내어 독자들에게 대답이 등장한다는 사실을 알림.
 - This study shows that ... (present)
 - This paper describes ... (present)
 - Our results indicate that ... (present)
 - In this study, we provide evidence that ... (present)
 - In this study, we have shown that (present perfect)
 - In this study, we have found that (present perfect)
 - In this study, we found that (past)

고찰의 전개

- 논리적으로, 중요도에 따라 전개
- 기존 연구와의 유사점, 차이점을 기술
- 연구의 참신성, 중요성을 제시
- 예기치 않은 결과, 제한점 설명
- 결과의 적용범위에 대한 언급

주요 결과 (Key Findings)를 제시하는 신호

- In our experiments ...
- ... can be attributed to ...
- We determined X by ...
- We found that ...
- Our data shows that ...
- ... has been demonstrated by ...

대답을 적절한 실험군이나 동물로 제한하라

- 대답은 해당되는 실험군으로 제한되어야 한다.
 - 인간을 대상으로 한 연구
 - ◆ *Respiratory distress syndrome* 이 있는 미숙아
 - 동물을 대상으로 한 연구
 - ◆ *대답이 동물에만 국한된 것인지 사람의 일부 혹은 전체에 적용 될 수 있는 것인지 명시해야*

비교(comparison) 의 신호

- ... consistent with ... (ref)
- Similar to ... (ref)
- ... has also been observed by ... (ref)
- X has been demonstrated ... (ref)

다른 연구와의 비교 및 대조 예문 (1)

- (연구의 결과) The frequency of targeted events among integrative transformants was about 30% for transformation with a vector that shares 1 kb of sequence homology with the genome. (다른 연구와의 비교) This targeting efficiency ***is comparable to*** that reported for insertion vectors sharing more than 2kb of sequence homology with the moss genome (16). (차이점) However, a targeting efficiency of 30% using 1 kb of genomic sequence is considerably higher than that previously observed in higher plants (0.1 3%) (18). (다른 연구와의 비교) The requirement for sequence homology for homologous recombination appears therefore to be stringent and comparable to that reported for mouse embryonic stem cells (37).

괴리의 설명

- 저자의 대답과 상반되는 괴리에 대해 설명.
 - ◆ *Apparent discrepancies between our human growth hormone values and those of earlier studies may be due to differences in study design. In our study, ... Earlier studies*

Conflicting results의 신호

- However, other studies found that ... (ref)
- ... is controversial ... (ref)
- ... does not agree with ... (ref)
- ... has also been reported ... (ref)

다른 연구와의 비교 및 대조 예문 (2)

- (연구의 결과) We observed virtually no size classes of mtDNA molecules. Since the undegraded circular mtDNA molecules were entirely of heterogeneous size, this observed size heterogeneity probably reflects the real situation within plant mitochondria.... (대조되는 결과의 등장 신호) ***In contrast to*** our observations, size classes of linear or circular molecules and species specific differences have been previously reported (24, 25). (차이점에 대한 설명) However, these studies were performed only with a fraction of supercoiled DNA (26), which most likely does not represent the complete set of molecules existing in *organello*. Supercoiled DNA isolated from a *C. album* suspension culture, for example, consisted exclusively of small circular plasmid mp1 DNA. Its oligomers were found in the open circular form, thus appearing indeed as a few size classes.

참신성의 강조

- 참신성은 서론에서 알려지지 않은 사실을 기술할 때 제시됨.
- 고찰에서 연구의 참신성을 상기시키려면 자신의 논점을 이미 알려진 사실과 대조.
 - *Partial cDNA clones have been reported for mouse(38-41), rat(41,42), and human(24) β -glucuronidase. In this study, we report the complete sequence of the full-length cDNA for human β -glucuronidase.*

제한점의 신호

- ... was not possible ...
- ... could not be measured ...
- ... was limited by ...
- Further observations are needed to ...

제한점 설명 예문

- Our data show that Ap assemblies did not colocalize in drusen. It is important to note, however, that the epitope for Ap may have been masked within the oligomeric structure, as is the case when Ap monomers are transformed into amyloid fibrils (40). Therefore, we cannot preclude the possibility that the oligomeric cores in drusen are made up of Ap.

- Our study had limitations. *First*, this was a retrospective study with the use of a single index lesion. *Second*, the selection of the volumetric functional MR imaging cutoffs (a 25% increase in ADC and a 65% decrease in PVP enhancement) was based on our study population and not on prior data. As such, the cutoff values to designate “response” using volumetric, functional MR imaging will require validation and optimization in future studies. *Another limitation* involved our use of only the index lesion to classify the response, even though some patients had a large disease burden that may have required response assessment of the entire intrahepatic tumor volume. ...

Unexpected findings의 신호

- Surprisingly ...
 - To our surprise ...
 - A surprising finding was that ...
 - ... was not expected.
-
- (예기치 않은 결과) ***To our surprise*** we discovered that the bindin fusion protein was being cleaved during isolation and purification. (예기치 않은 결과에 대한 설명) The proteolysis is remarkable efficient since only small amounts of the unprocessed form remain (Fig. 2, lane 3). We purified the cleaved bindin product to homogeneity by reverse phase HPLC and sequenced it to determine the site of cleavage. The predominant product is the mature bindin polypeptide containing an additional 4 amino acids of probindin and a minor product that corresponds to bindin containing a single additional amino acid. Both products contain arginine as the N-terminal amino acid. These results suggest that the fusion protein is cleaved at two sites: the Arg-Arg junction between the factor Xa linker and the probindin coding sequence and within the probindin segment at the Lys-Arg junction.

가설 제시의 신호

- Our results lead to the conclusion that ...
- From these data we hypothesize that ...
- We propose the following new principle ...

가설 제시 예문

- We found that the substrate 3H-[9R]iP moves into the cells where it does not accumulate to concentrations higher than in the medium. However, the mechanism of 3H-[9R] iP uptake is unclear. Because no extracellular activities for the deribolisation of 3H-[9R]iP could be detected, ***we hypothesize that*** it is metabolized intracellularly to 3H-iP and that the bidirectional transport of IP is based on passive diffusion.

고찰의 마무리



- 요약하라.
- 강조하라. (중요성)
- 시사하라.

요약의 신호

- In summary ...
- In conclusion, ...
- Finally, ...
- Taken together ...
- To summarize our results, ...
- We conclude that ...
- Overall, ...

결론에 추측과 앞으로 연구 방향을 기술

- (질문에 대한 답) In summary, we found no statistically significant associations between increased homocysteine (HCY) and age-related macular degeneration (AMD) after analyzing a large and well-characterized population of patients with and without maculopathy from two geographic areas in the United States. (주요 결과와 결론) An analysis of smoking and HCY tertile subgroups did not show any association between smoking, increased HCY, and increased risk of intermediate or advanced AMD. (추측과 앞으로의 연구 방향) An association between homocysteine levels and an increased risk of intermediate or advanced AMD *may exist* for patients for whom HCY is above the 90th percentile of HCY, as these patients were more likely to have intermediate or advanced AMD. When subjected to statistical analysis, this observation was found to be not significant however, and only a larger study cohort could determine whether there is any true association.

Significance의 신호

- Our findings can/will serve to ...
- ... can be used

- We recommend that X is ...
- Y should be used for ...
- ... is probably ...
- Y indicates that X might ...
- These findings imply that X may ...

- Here we propose that ...
- ... we hypothesize that ...

- (질문에 대한 답) ***In summary***, our work reveals the functional interactions involved in the binding of antibiotics to the peptidyl transferase cavity of the bacterial ribosome. (주요 결과) None of the antibiotics examined show any direct interaction with ribosomal proteins. Chloramphenicol targets mainly the A site, where it interferes directly with substrate binding. Clindamycin interferes with the A site and P site substrate binding and physically hinders the path of the growing peptide chain. Macrolides bind at the entrance to the tunnel where they sterically block the progression of the nascent chain. (응용 가능성 제시를 통한 중요성 기술) The structural model of the peptidyl transferase center in complex with the examined antibiotics can *not only enable* a rational approach for antibiotic development and therapy strategies but *can also be used to identify new target sites* on the eubacterial ribosome.

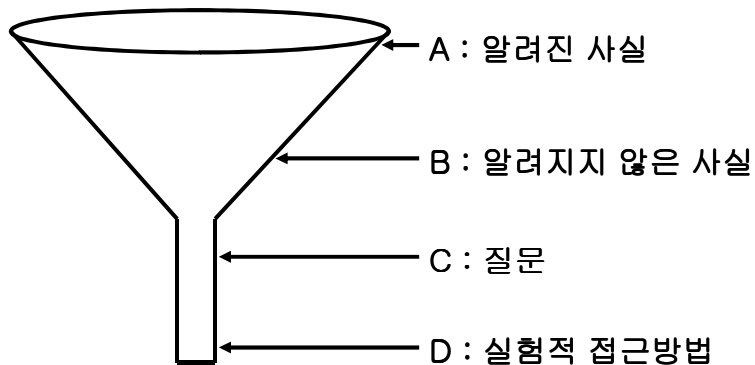
고찰 작성 지침

- 주요연구결과를 기술하고 해석하여, 연구 질문에 답한다.
- 피라미드 구조를 따라 구성한다.
 - 처음: 주요 결과에 의거하여 연구 질문에 답하고, 뒷받침하는 증거 제시
 - 중간: 다른 연구들과 비교하고 대조, 차이점 설명. 연구의 제한점, 예기치 않은 결과, 가설이나 모델.
 - 마무리: 요약, 일반화, 중요성, 시사점
- 중간 부분은 논리적 단계나 중요도 순으로 구성.
- 각 단계별 전환의 신호를 사용.
- 독자층을 염두에 두어야 한다.

Summary

서론의 구조 : 가설검증논문

“깔때기 구조” (Funnel Structure)

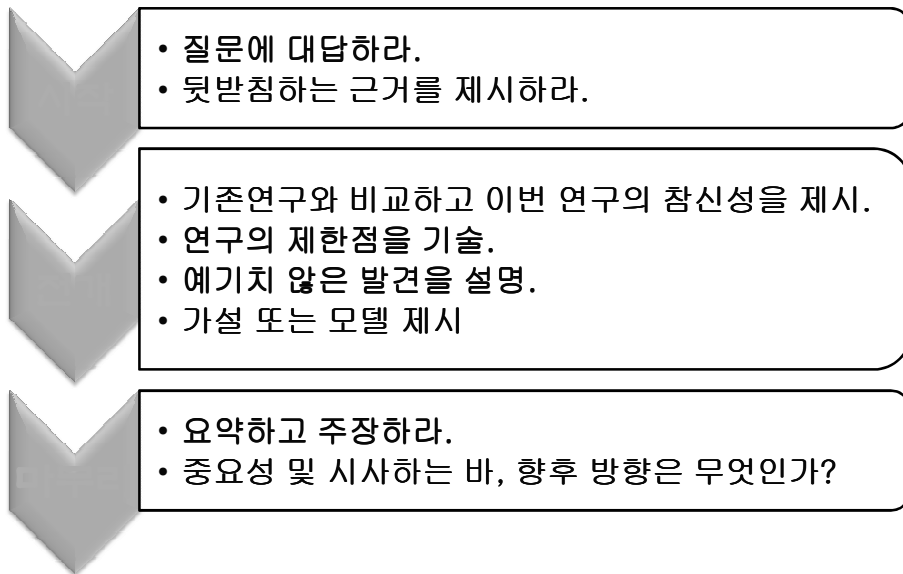


Optional:
Results/Conclusion/Significance

재료 및 방법에서 흔히 보이는 오류

- 필요한 자세한 내용이 빠짐.
- 특정 실험을 왜 했는지 알 수 없는 경우.
- 특별한 이유 없이 수동태에서 능동태로.
- 특별한 이유 없이 과거시제에서 현재시제로.

고찰의 3단 구성



Thank you for your attention!

